

CLAIMS:

- [c1]** 1. A method of atomization and combustion, the method comprising:
- mixing a volume of liquid fuel with a volume of a corresponding soluble gas to create a liquid fuel/dissolved gas mixture;
- pressurizing the liquid fuel/dissolved gas mixture;
- discharging the liquid fuel/dissolved gas mixture through a discharge opening in fluid communication with a lower pressure chamber forming droplets of the liquid fuel/dissolved gas mixture, wherein said soluble gas emerges from solution further breaking up the droplets forming smaller droplets; and
- combusting the smaller droplets in the chamber.
- [c2]** 2. The method of claim 1 wherein the dissolved gas and liquid fuel have similar polarity providing mutual solubility with one another.
- [c3]** 3. The method of claim 1 wherein the liquid fuel is a hydrocarbon based fuel and the soluble gas is one of NO, O₂, N₂, He, and Ar.
- [c4]** 4. The method of claim 3 wherein the liquid fuel is diesel fuel.
- [c5]** 5. The method of claim 3 wherein said chamber is a combustion chamber in an internal combustion engine.
- [c6]** 6. The method of claim 1 herein said chamber is a combustion chamber in one of a furnace, cylinder of an internal combustion engine, a combustor for a turbine, or any other device where fuel is burned in air.
- [c7]** 7. The method of claim 1 wherein said discharge opening includes a nozzle of a fuel injector.

[c8] 8. The method of claim 7 wherein the fuel injector is configured to break the liquid fuel/dissolved gas mixture into said droplets.

[c9] 9. The method of claim 8 wherein said chamber is a combustion chamber in a locomotive.

[c10] 10. The method of claim 8 wherein said discharge opening is disposed in one of a cylinder, a manifold, and a combustor.

[c11] 11. The method of claim 1 wherein the mixing said volume of liquid fuel with said volume of said corresponding soluble gas is done when both are under pressure.

[c12] 12. The method of claim 1 further comprising:

operatively connecting an air supply to the chamber, said air supply configured to flow high pressure air into said chamber to promote said combustion.

[c13] 13. A system for atomization and combustion, the system comprising:

a mixer for mixing a volume of liquid fuel with a volume of a corresponding soluble gas to create a liquid fuel/dissolved gas mixture;

a combustion chamber in fluid communication with said mixer; and

an atomization system connected to the mixer downstream from the mixer and to the combustion chamber upstream from the combustion chamber, the atomization system including an atomizer having a discharge opening configured to discharge the atomized liquid fuel/dissolved gas mixture through a discharge opening in fluid communication with said chamber having a lower pressure forming droplets of the liquid fuel/dissolved gas mixture, wherein said soluble gas emerges from solution further breaking up the droplets forming smaller droplets for combustion in said chamber.

[c14] 14. The system of claim 13 wherein the system further comprises a pump connected to the mixer and the atomization system, to pressurize the mixture and force the mixture downstream to the atomization system.

[c15] 15. The system of claim 13 wherein the soluble gas and liquid fuel have similar polarity providing mutual solubility with one another.

[c16] 16. The system of claim 13 wherein the liquid fuel is a hydrocarbon based fuel and the soluble gas is one of NO, O₂, N₂, He, and Ar.

[c17] 17. The system of claim 16 wherein the liquid fuel is diesel fuel.

[c18] 18. The system of claim 16 wherein said chamber is a combustion chamber in an internal combustion engine.

[c19] 19. The system of claim 13 herein said chamber is a combustion chamber in one of a furnace, cylinder of an internal combustion engine, a combustor for a turbine, or any other device where fuel is burned in air.

[c20] 20. The system of claim 13 wherein said discharge opening includes a nozzle of a fuel injector.

[c21] 21. The system of claim 20 wherein the fuel injector is configured to break the liquid fuel/dissolved gas mixture into said droplets.

[c22] 22. The system of claim 20 wherein said discharge opening is disposed in one of a cylinder, a manifold, and a combustor.

[c23] 23. The system of claim 13 further comprising a pump for pressurizing the liquid fuel and soluble gas during mixing.

[c24] 24. The system of claim 13 further comprising:

an air supply operatively connected to the chamber, said air supply configured to flow high pressure air into said chamber to promote said combustion.

[c25] 25. A diesel locomotive internal combustion engine comprising at least two cylinders, each having a reciprocating piston operatively connected to a crank and a combustion chamber, also comprising means for injecting a liquid fuel into the combustion chambers of an internal combustion diesel engine comprising:

a means for mixing a volume of the liquid fuel with a volume of a corresponding soluble gas to create a liquid fuel/dissolved gas mixture;

a means for pressurizing a resulting liquid fuel/dissolved gas mixture; and

a means for discharging the liquid fuel/dissolved gas mixture through a discharge opening in fluid communication with each chamber having lower pressure forming droplets of the liquid fuel/dissolved gas mixture, wherein said soluble gas emerges from solution further breaking up the droplets forming smaller droplets configured to promote combustion of the smaller droplets in the chamber.